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ANTIBIOTICS IN THE PRESERVATION OF FRESH MEAT AND POULTRY

By Alfred GINSBERG,
Dr. Med.Vet.,
Ph.D., B.V.Sc., M.R.C.V.S., M.R.S.H.,
Department of Veterinary Services, Kenya

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ANTIBIOTICS IN THE PRESERVATION OF FRESH MEAT AND POULTRY

Alfred Ginsberg, Dr.Med.Vet., Ph.D., B.V.Sc.,
M.R.C.V.S., M.R.S.H.

Department of Veterinary Services, Kenya.

1. Throughout the ages, man has devised various methods for prolonging the storage life of perishable foods and, whilst many of these methods have since been rejected, others are still in use. The majority were based upon drying, salting, canning, cooking, fermenting or freezing. As a result of extensive research, observation, and practical experience, most foods can today be preserved for an indefinite period without affecting either their quality or palatability. The problem of preserving meat, poultry and fish, however, has not been entirely solved. Good though the modern methods are, they not only affect to a certain extent flavour and colour, but also generally demand expensive installations and maintenance. It has, therefore, not been surprising that the food producer should turn his attention towards antibiotics, once their potent bacteriostatic and bactericidal properties have been proved in human medicine. The lead in this search for a new and more practical preservative was taken by the United States where, in 1955, an antibiotic for the conservation of fresh poultry was introduced into the Food and Drugs Act.

2. Although this idea has steadily gained ground all over the world, little use is being made of these new drugs as a preservative for staple foods. It is feared, rightly or wrongly, for instance, that treated meat eaten in quantity may have ill effects upon health or that unscrupulous butchers may try to cover insanitary or unhygienic practices as they have done many times in the past with other preservatives. Whatever the reason, the fact remains that the absence of proper methods of preservation, in underdeveloped countries in particular, not only affects national economy but constitutes a threat to health. In lands where cold storage facilities are few, a method should be found to prolong the keeping quality of perishable foods, in particular meat, poultry and fish.

3. To study the effectiveness of antibiotics we decided to give a trial to Oxytetracycline and Potassium sorbate, known commercially as Biostat and Sorbistat-K, and Chloratetracycline - Acronize in the preservation of fresh red meat and poultry. The experimental slaughter stock was composed of animals of average quality and consisted of 28 cattle, 24 sheep, 10 goats and 24 chickens. These animals were slaughtered in three groups; in the Athi River and Mombasa meat works of the Kenya Meat Commission, in a very simple local African abattoir and in typical primitive conditions under the shade of a thorn tree on the bare soil such as practised in the native reserve. The most unfavourable season for the keeping of any fresh foods was chosen for these experiments, namely the onset of the long rains. The carcasses were exposed to the temperatures of two different altitudes; the heat at sea level registering 90°F in the shade with a relative humidity of 100%, and the colder and drier climate of the 7,000 feet highlands. The post-mortem handling and treatment of the meat also varied considerably. While some of the quarters were moved immediately after slaughter, others were allowed to remain and lose their body heat in the hanging hall of the meat works. While a number were transported in a hanging position in clean and properly insulated meat vans, others were carried in the back of a station wagon or even in an open push cart used by the native butcher. The final destinations were as diverse as the means of transport. Some quarters were taken to a first-class European butcher shop, others were placed almost one on top of the other in an unhygienic African butcher, while others were exposed during 12 hours to the heat, dust and fly contamination of a native market stall in Mombasa. All experimental carcasses were held for 72 hours in the case of treatment with Biostat, 96 hours with Sorbistat-K and 96 hours when Acronize was used. The experimental animals were divided into groups and the antibiotic was applied either ante-mortem while the stock was resting in lairage or post-mortem after bleeding and dressing had been completed.

4. Five methods of applying the antibiotics were chosen and consisted of intravenous, intramuscular and intraperitoneal injections given four hours prior to slaughter, or an antibiotic spray applied immediately after the carcass was fully dressed and trimmed and finally by dipping in an antibiotic solution; this also after the carcass was completely prepared to leave the abattoir.

5. Biostat, injected intraperitoneally two hours prior to slaughter extends the keeping quality of fresh beef from 24 to 72 hours. Its use in slaughterhouses, however, cannot be

recommended as the immobilisation and injecting of each beast is a lengthy procedure upsetting the routine of even a small abattoir. Any method of preservation with an acceptable antibiotic must be simple and quick enough in application to fit into any routine abattoir procedure.

6. The spray with Biostat successfully replaces the intraperitoneal injection and is a method which can be fitted into the production line of any abattoir without any difficulty.

7. Acronize tends to taint the carcass if applied as a spray. Intravenously it is able to extend the keeping quality, but for reasons explained above this method is unsuitable.

8. Sorbistat-K applied as a spray undoubtedly gives the most promising results. Not only does it extend the keeping quality for up to 72 hours but it preserves the good appearance of the carcass and surpresses the growth of moulds so troublesome in hot and humid climates. Being readily dissolved in water it presents no difficulty when used in abattoir routine.

9. Although in their present form none of the drugs can replace cold storage, they can extend the keeping quality of beef for the desired 48 hours after slaughter. This critical period is of great importance to the butcher in tropical and subtropical countries who is not interested in preserving the meat for any longer period than the time required to sell off the carcass should he fail to attract sufficient customers in the normal 12 hours.

10. The preservation of small stock carcasses was disappointing. Even Sorbistat-K was unable to extend the keeping quality of sheep carcasses beyond 34 hours. Admittedly the animals used in the trials were of low quality but they represented the normal stock of the native areas.

11. The trials have made it quite clear that an antibiotic can neither be used to mask the poor state of the carcass nor can it improve its natural condition.

12. The preservation of poultry by the standard dipping method but without the addition of ice, proved to be a complete failure. (Trials with Sorbistat-K were not carried out). Not until the strength of the dipping solution was doubled or even trebled could the "shelf life" of the treated carcasses be prolonged by 48 hours. The treated carcasses then developed a different "off" odour from the control but the flesh remained

firm and did not become slimy as in the latter. The odour was not so pronounced as in the control and was more difficult to identify.

13. For the purpose of bacteriological examination surface cuts and deep tissue samples as well as swabs were taken. The contaminating organisms were mainly non lactose fermenting gram-negative rods and micrococci, whilst streptococci, usually faecalis but sometimes lactis or Type D, formed a variable proportion of the spoilage organisms. Lactobacilli and yeasts were not generally prominent although a heavy surface growth of an imperfect yeast of the genus Trichosporon occured on the sheep carcasses kept in Mombasa and not sprayed with Sorbistat-K. Of the gram-negative rods the frequent dominance on the sheep and also some beef (Mombasa) carcasses of Proteus spp., a genus with a high natural drug tolerance, may give cause for concern in carcasses treated with Biostat. The carcasses resisted clostridial spoilage while the control became infected with these organisms and coagulase positive staphylococci were suppressed.

14. The appearance of the treated carcasses, particularly those sprayed with Sorbistat-K, was good, but claims that an antibiotic has a tenderising effect could not be substantiated.

15. Heavy bacterial contamination interfered with the assay for residual oxytetracycline. In two tests, however, bacterial development was negligible, and these provide valid data of oxytetracycline persistence at low and high temperatures. The intraperitoneal injection of 15 grammes Biostat per 1,000 lb. liveweight gives a persisting residue of just over a microgramme per gramme of muscle tissue for at least three days. Using the spray method, however, antibiotic was not detected after the first day.

16. The accumulated assay of all treated meat samples with chloratetracycline showed either negative results or negligible amounts of antibiotic residue.

17. The whole subject of antibiotics has led to heated controversy. As antibiotics vary considerably in their chemical structure, in their toxicity and their selective action on bacteria, and as some organisms are able to develop a resistance to them, this particular disadvantage is a cause of concern to the public health worker. The fear is expressed that, were antibiotics used as food preservatives, bacterial resistance might be induced. The positive opinion, on the other hand, suggests that the use of antibiotics in the preservation of fresh meat, poultry and fish does not constitute a hazard to public health. But even if it could definitely be proved that no danger exists from the addition of well-established

quantities of antibiotics, methods governing their use must be laid down by law as the indiscriminate application of any preservative is a practice to be avoided. Preservation, it should be clearly understood, was never intended to replace hygiene nor to cover up developing spoilage, but to prolong the freshness of foods under commercial conditions and afford protection when unforseen delay occurs during normal distribution.

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